# ULDB Balloon Vehicle and Recovery Systems

# Current LDB Vehicle



- **Suspended Weight to 8000 lbs**
- **Altitude to 130,000’**
- **Duration Limits ~7 days (Non-Polar) to ~24 days (Polar)**
- **Diurnal Excursion 5 kft to 40 kft (Wx)**

# ULDB Vehicle Functional Requirements



- **Duration to 100 days (Non-Polar)**
- **Suspended Weight ~ 3000 lbs**
- **Altitude 120,000 - 130,000’**
- **Diurnal Excursion < 5000’ (Non-Polar)**
  - **Science**
  - **Survival**

# ULDB Vehicle Design Requirements



- **Long Duration Survival**
  - **materials**
  - **systems**
- **Altitude Control**
- **Mission**
  - **Launch**
  - **Trajectory (Ground Track)**
  - **Termination**

# ULDB Vehicle Technology Development



- **Materials**
- **Fabrication**
- **Vehicle Diurnal Altitude Control**
- **Structural Design/Testing**
- **Mission Technology**

# ULDB Materials Technology Issues



- **Strength to Weight**
- **Radiative Properties**
- **Manufacture**
- **Fabrication**
- **Exposure**
- **(Cost)**

# ULDB Fabrication Technology Issues



- **Seaming**
- **Fitting Installation**
- **Quality Control**
- **Cost**
  - **machinery development**
  - **labor**

# ULDB Altitude Control Technology Issues



- **Pressurization (Super Pressure)**
- **Gas Thermal Control**
  - **active**
  - **passive**
- **Ballast**
- **Direct Volume Control**

# ULDB Structural Design Technology Issues



- **Weight Minimization**
- **Load Transfer**
- **Manufacturing Flaws**
- **Fitting Design**
- **Material Characterization**
- **Launch and Ascent Modeling**
- **Testing**

# ULDB Mission Technology Issues



- **Launch**
- **Trajectory Control**
- **Termination**
- **Recovery (Envelope)**

# Current Recovery System



- **Unpacked Circular Chutes**
- **< 20 ft/s Vertical Impact Velocity**
- **Up to 150’ Diameter**
- **Released at Float/ No Reefing**
- **Very High Reliability**
- **Impact Zone Determined by Descent Vector**

# ULDB Recovery System Functional Requirements



- **< 3000 lbs from 130,000’**
- **Safety**
  - **Remote Planned, <20 ft/s Vertical, proper CE**
  - **Accuracy, proper CE**
- **Payload Protection**
- **Flexible**
- **Water/Land Recovery**

# ULDB Recovery System Design Requirements



- **100 Day Exposure**
- **Integrated in Flight System**
- **Gondola Integrated Design Elements**
- **Autonomous Capability**
- **High Reliability**
- **Cost**

# ULDB Recovery System Technology Development



- **Water Impact**
- **Water Recovery**
- **Balloon System Integration**
- **Location Aids**
- **Payload Protection (e.g. chute cutaway)**
- **Mission Recovery Planning**